

EMFAC Modeling Change Technical Memo

SUBJECT: FACILITY SPECIFIC ALLOCATION FACTORS

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Background

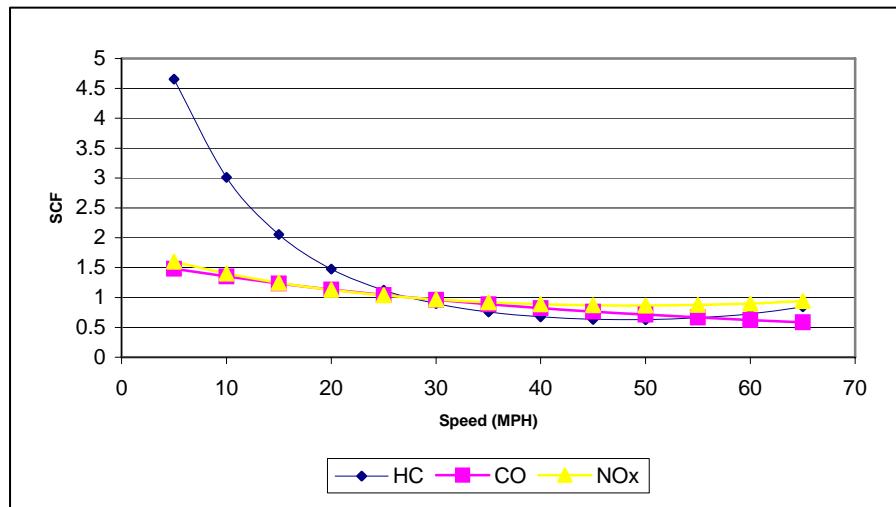
The relationship between vehicle exhaust emissions and speed is determined empirically by testing vehicles over several cycles with differing average speeds. Air Resources Board staff (ARB) have developed 13 different cycles designed to be representative of real world driving at speeds ranging from five to sixty five miles per hour (mph). The gram per mile emissions measured over these speed correction or Unified Correction Cycles (UCC) are normalized to each vehicles emissions as measured over the LA92 or Unified Cycle.

The result is a continuous speed correction factor curve (SCF) which is used to modify the basic emission rates in EMFAC. The SCFs are "U" shaped signifying higher emissions at the extremes of speed (See Figure 1). Given that exhaust emissions are expressed in terms of grams per mile, the emission rates can be viewed as a fraction. Increases in the emission rates are attributable to either a more rapid decline in the denominator with respect to the numerator, (speeds approaching zero), or a more rapid increase in the numerator with respect to the denominator, (rapid emissions increases at higher speeds).

The speed corrected emission factors are coupled with estimates of miles per day driven by speed to produce ton per day inventory estimates. However, the activity data, which is provided by local transportation planning organizations, tends to represent instantaneous driving events while the SCFs represent trips. That is, all of the UCC cycles begin and end at idle. This miss-match between emissions and activity tends to artificially inflate the inventory.

This disconnect between emissions and activity coupled with the need for better spatial resolution for the allocation of emissions attributable to on-road mobile sources have prompted this proposed change to the EMFAC model. The proposed change would have no impact on the tons per day estimates produced by EMFAC and should be viewed as the initial step toward developing facility specific estimates of emissions by speed.

Figure 1. Speed Correction Factors for Fuel Injected Vehicles



Methodology

The following allocation factors are being supplied for incorporation into the next revision of the State of California's emission inventory model, EMFAC 2005. EMFAC currently reports emissions on a ton per day basis by pollutant. Some who utilize EMFAC, however, also need emissions to be allocated by facility type. The purpose of these factors is to distribute emissions by facility and speed as an output option in EMFAC.

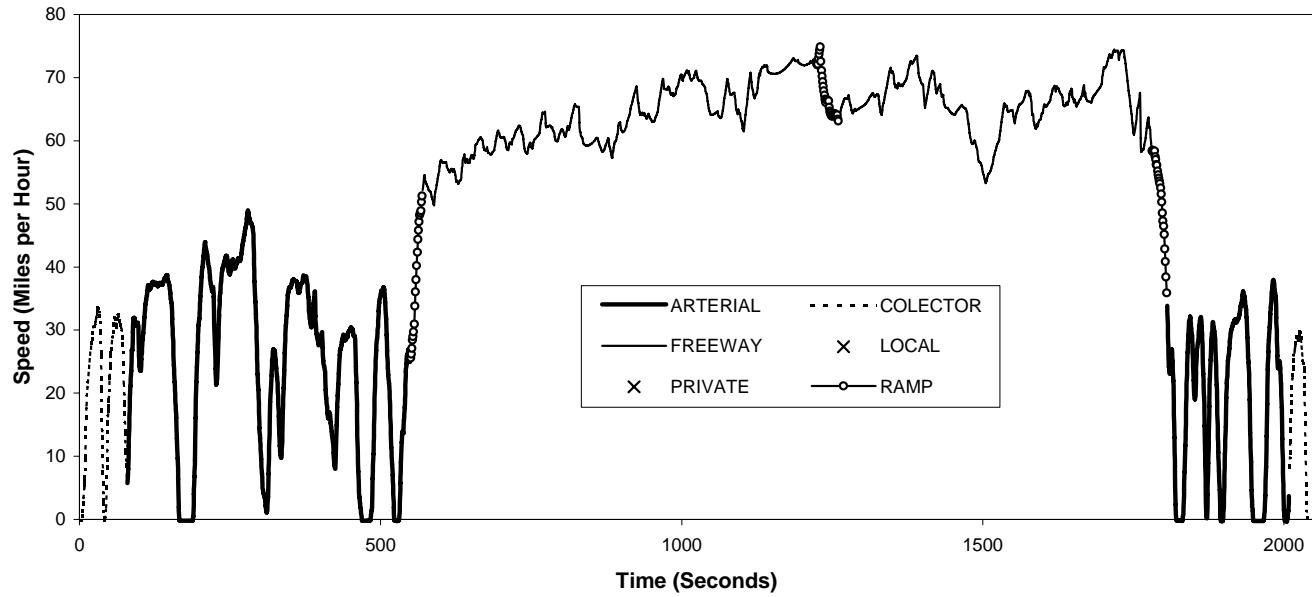
The data used for this analysis consists of vehicles tested during Surveillance Programs conducted at the Air Resources Board (Table 1). The first set includes 41 vehicles tested over 8 different cycles. These cycles have generally been used to develop speed correction factors for EMFAC. They are the UCC15, UCC20, UCC25, UCC30, UCC35, UCC40, UCC45, and UCC50. The acronym "UCC" stands for Unified Correction Cycle and the number is an indication of average speed. The second data set includes 11 vehicles tested on the Low Speed (LS) cycle. The LS cycle characterizes a driving trace with an average speed of approximately 5 miles per hour. Vehicles from both programs consist of passenger cars and light-duty trucks, with different fuel systems, with and without catalysts. During preliminary analysis, however, there was no evidence that any of these parameters affected emissions as a function of speed that would suggest separate analyses. For this reason, the entire set of vehicles was evaluated together.

Data for each vehicle contains second-by-second modal emissions for each cycle. In addition, speed and facility type is associated with each second of driving in a given cycle. Figure 2 illustrates this by outlining the different facilities and speeds implicit within the UCC50 cycle. Figure 3 shows corresponding NOx emissions produced by one of the test vehicles, a 1994 Honda Civic, driven on the same cycle. By combining emissions data with facility information, emissions can be aggregated, and then assigned to each facility for all speeds (i.e., Vehicle A emitted 7 grams of NOx on an arterial at 20 mph during the UCC50 cycle). The same can be done for time and distance. It is through this data that Facility Specific Allocation Factors are formulated. Ultimately, these factors allocate emissions, time, and distance by facility and speed.

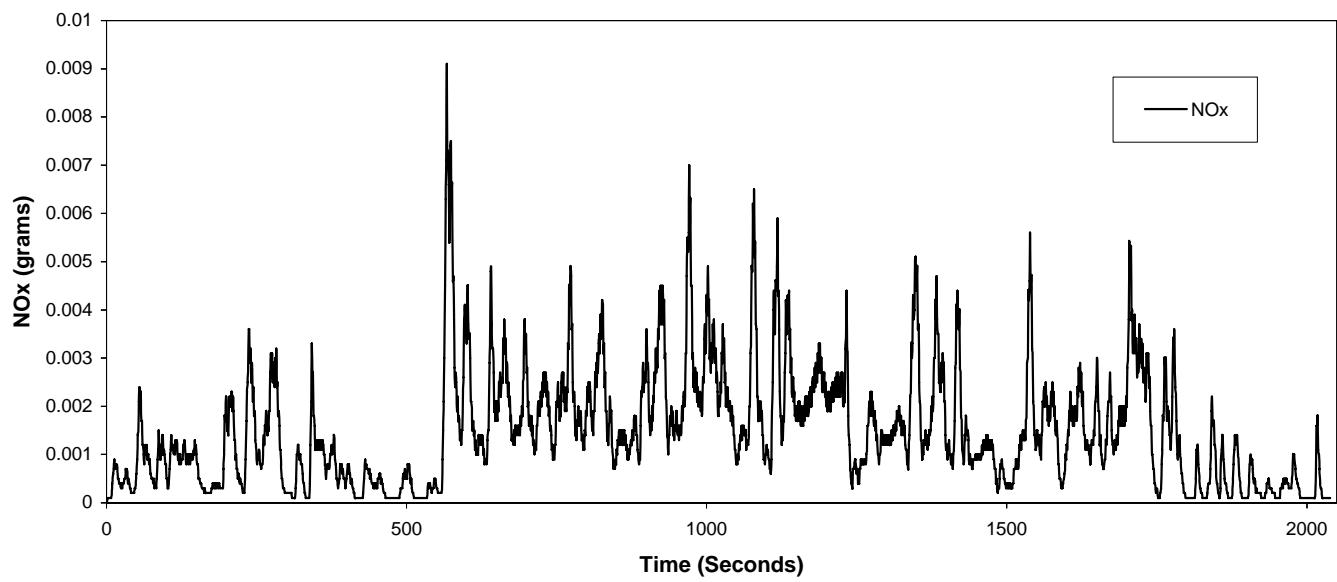
The matrices in this memorandum provide three allocation factors. The first set of tables (Table 2) includes the VMT (vehicle miles traveled) distribution. It breaks down the percent of vehicle miles traveled by facility and speed within a given cycle. When applied, these factors distribute total miles driven by facility and instantaneous speed. The second set of values (Table 3) distributes the emissions in the same manner, by facility and speed. The final table (Table 4) allocates running loss emissions based on the time spent on each facility at the designated speeds within each cycle. When applied, the factors in tables 3 and 4 take the total tons per day by trip speed calculated in EMFAC, and allocate them by facility and instantaneous speed. Instantaneous speed is defined as the specific speeds occurring within a trip, ranging from 0 to 75 miles per hour.

Table 1. Vehicle Set

Figure 2. Speed Trace of UCC50 Cycle



**Figure 3. NOx Emissions UCC50 Cycle
1994 Honda Civic**



These allocation factors are applicable to all Light-Duty Automobiles (LDA), Light-Duty Trucks (LDT), and Medium-Duty Trucks (MDT). The types of facilities include arterial, collector, local, freeway, and ramp. In addition, these allocation factors are applicable to running exhaust emissions only. They do not apply to evaporative emissions. The data set used in this analysis did not contain test data for particulate matter (PM). Until more data can be obtained, the allocation factors for HC will also be applied to PM. Data was also not available for a trip speed of 10-mph and for those trips greater than 50-mph. For this reason, data from the 5-mph trip will be used for the 10-mph trip, and data from the 50-mph trip will be used for trip speeds greater than 50-mph. All other pollutants including tire wear, brake wear, and SOx will be distributed by distance only. Finally, since idle emissions are independent of distance, there are no VMT allocation factors for idle.

The following is an example of how the allocation factors will be applied.

$$HC_{15\text{mph trip}} \times FSEAF_{\text{arterial } 25\text{mph}} = \text{Total HC emitted by vehicles on arterials travelling at 25 mph within 15 mph trip}$$

Where $HC_{15\text{mph trip}}$ = HC emissions attributed to 15mph trip (tons per day)
 $FSEAF_{\text{arterial } 25\text{mph}}$ = Facility Specific Emission Allocation Factor for an arterial at 25 mph

Summing across all trips will give cumulative tons per day value for all emissions by pollutant, facility, and speed.

As an example, assume the total HC emissions attributed to the 45-mph trip is 10 tons per day. By applying the HC allocation factors for the 45-mph cycle in table 3 of this memorandum, the resulting output would be summarized in the following table. Table 5 gives the resulting tons per day occurring on each facility at each instantaneous speed attributed to the 45-mph trip.

Table 5. Emissions in Tons per Day by Facility and Speed from 45-mph Trip

HC	ARTERIAL	COLLECTOR	LOCAL	FREEWAY	PRIVATE	RAMP
0	0.238	0.082	0.000	0.017	0.000	0.000
5	0.138	0.060	0.000	0.072	0.000	0.129
10	0.101	0.013	0.000	0.025	0.000	0.028
15	0.116	0.000	0.000	0.065	0.000	0.061
20	0.157	0.000	0.000	0.115	0.000	0.181
25	0.266	0.000	0.000	0.041	0.000	0.233
30	0.208	0.000	0.084	0.048	0.000	0.297
35	0.207	0.000	0.068	0.000	0.000	0.279
40	0.442	0.000	0.145	0.000	0.000	0.254
45	0.434	0.000	0.189	0.000	0.000	0.203
50	0.396	0.000	0.475	0.000	0.000	0.197
55	0.000	0.000	0.438	0.000	0.000	0.171
60	0.000	0.000	1.363	0.000	0.000	0.246
65	0.000	0.000	1.106	0.000	0.000	0.017
70	0.000	0.000	0.599	0.000	0.000	0.000
75	0.000	0.000	0.000	0.000	0.000	0.000
Total	2.702	0.155	4.466	0.383	0.000	2.294

Table 2. VMT Allocation Factors by Facility / Speed

2a. 5 MPH							2b. 10 MPH						
	Arterial	Collector	Local	Freeway	Ramp	Private		Arterial	Collector	Local	Freeway	Ramp	Private
5	0.000	0.000	0.209	0.000	0.000	0.000	5	0.000	0.000	0.209	0.000	0.000	0.000
10	0.000	0.000	0.258	0.000	0.000	0.000	10	0.000	0.000	0.258	0.000	0.000	0.000
15	0.000	0.000	0.218	0.000	0.000	0.000	15	0.000	0.000	0.218	0.000	0.000	0.000
20	0.000	0.000	0.138	0.000	0.000	0.000	20	0.000	0.000	0.138	0.000	0.000	0.000
25	0.000	0.000	0.176	0.000	0.000	0.000	25	0.000	0.000	0.176	0.000	0.000	0.000
30	0.000	0.000	0.000	0.000	0.000	0.000	30	0.000	0.000	0.000	0.000	0.000	0.000
35	0.000	0.000	0.000	0.000	0.000	0.000	35	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.000	0.000	0.000	0.000	0.000	40	0.000	0.000	0.000	0.000	0.000	0.000
45	0.000	0.000	0.000	0.000	0.000	0.000	45	0.000	0.000	0.000	0.000	0.000	0.000
50	0.000	0.000	0.000	0.000	0.000	0.000	50	0.000	0.000	0.000	0.000	0.000	0.000
55	0.000	0.000	0.000	0.000	0.000	0.000	55	0.000	0.000	0.000	0.000	0.000	0.000
60	0.000	0.000	0.000	0.000	0.000	0.000	60	0.000	0.000	0.000	0.000	0.000	0.000
65	0.000	0.000	0.000	0.000	0.000	0.000	65	0.000	0.000	0.000	0.000	0.000	0.000
70	0.000	0.000	0.000	0.000	0.000	0.000	70	0.000	0.000	0.000	0.000	0.000	0.000
75	0.000	0.000	0.000	0.000	0.000	0.000	75	0.000	0.000	0.000	0.000	0.000	0.000
2c. 15 MPH							2d. 20 MPH						
	Arterial	Collector	Local	Freeway	Ramp	Private		Arterial	Collector	Local	Freeway	Ramp	Private
5	0.007	0.019	0.006	0.000	0.002	0.000	5	0.013	0.007	0.004	0.002	0.000	0.000
10	0.014	0.041	0.010	0.000	0.001	0.000	10	0.016	0.013	0.005	0.004	0.000	0.000
15	0.019	0.049	0.022	0.000	0.000	0.000	15	0.052	0.020	0.009	0.003	0.000	0.000
20	0.057	0.089	0.032	0.000	0.000	0.000	20	0.068	0.029	0.008	0.000	0.000	0.000
25	0.091	0.118	0.121	0.000	0.000	0.000	25	0.076	0.082	0.019	0.000	0.000	0.000
30	0.060	0.065	0.031	0.000	0.000	0.000	30	0.105	0.068	0.029	0.000	0.000	0.000
35	0.000	0.147	0.000	0.000	0.000	0.000	35	0.116	0.020	0.000	0.000	0.000	0.000
40	0.000	0.000	0.000	0.000	0.000	0.000	40	0.167	0.000	0.000	0.000	0.000	0.000
45	0.000	0.000	0.000	0.000	0.000	0.000	45	0.064	0.000	0.000	0.000	0.000	0.000
50	0.000	0.000	0.000	0.000	0.000	0.000	50	0.000	0.000	0.000	0.000	0.000	0.000
55	0.000	0.000	0.000	0.000	0.000	0.000	55	0.000	0.000	0.000	0.000	0.000	0.000
60	0.000	0.000	0.000	0.000	0.000	0.000	60	0.000	0.000	0.000	0.000	0.000	0.000
65	0.000	0.000	0.000	0.000	0.000	0.000	65	0.000	0.000	0.000	0.000	0.000	0.000
70	0.000	0.000	0.000	0.000	0.000	0.000	70	0.000	0.000	0.000	0.000	0.000	0.000
75	0.000	0.000	0.000	0.000	0.000	0.000	75	0.000	0.000	0.000	0.000	0.000	0.000
2e. 25 MPH							2f. 30 MPH						
	Arterial	Collector	Local	Freeway	Ramp	Private		Arterial	Collector	Local	Freeway	Ramp	Private
5	0.008	0.000	0.007	0.000	0.000	0.000	5	0.007	0.000	0.000	0.002	0.001	0.000
10	0.008	0.001	0.008	0.000	0.001	0.000	10	0.010	0.000	0.000	0.017	0.004	0.000
15	0.026	0.007	0.018	0.000	0.000	0.000	15	0.020	0.000	0.000	0.030	0.002	0.000
20	0.025	0.007	0.034	0.000	0.000	0.000	20	0.031	0.000	0.000	0.047	0.002	0.000
25	0.045	0.012	0.034	0.000	0.000	0.000	25	0.043	0.000	0.000	0.016	0.004	0.000
30	0.082	0.027	0.054	0.000	0.000	0.000	30	0.089	0.000	0.000	0.042	0.002	0.000
35	0.190	0.015	0.031	0.000	0.000	0.000	35	0.055	0.000	0.000	0.014	0.004	0.000
40	0.221	0.000	0.000	0.000	0.000	0.000	40	0.023	0.000	0.000	0.031	0.006	0.000
45	0.070	0.000	0.000	0.000	0.000	0.000	45	0.003	0.000	0.000	0.092	0.010	0.000
50	0.068	0.000	0.000	0.000	0.000	0.000	50	0.000	0.000	0.000	0.170	0.042	0.000
55	0.000	0.000	0.000	0.000	0.000	0.000	55	0.000	0.000	0.000	0.130	0.031	0.000
60	0.000	0.000	0.000	0.000	0.000	0.000	60	0.000	0.000	0.000	0.020	0.000	0.000
65	0.000	0.000	0.000	0.000	0.000	0.000	65	0.000	0.000	0.000	0.000	0.000	0.000
70	0.000	0.000	0.000	0.000	0.000	0.000	70	0.000	0.000	0.000	0.000	0.000	0.000
75	0.000	0.000	0.000	0.000	0.000	0.000	75	0.000	0.000	0.000	0.000	0.000	0.000

Table 2 continued

2g. 35 MPH							2h. 40 MPH						
	Arterial	Collector	Local	Freeway	Ramp	Private		Arterial	Collector	Local	Freeway	Ramp	Private
5	0.005	0.000	0.000	0.003	0.001	0.000	5	0.004	0.001	0.000	0.000	0.000	0.001
10	0.007	0.001	0.000	0.005	0.003	0.000	10	0.015	0.000	0.000	0.000	0.001	0.001
15	0.013	0.000	0.000	0.020	0.000	0.000	15	0.014	0.004	0.000	0.000	0.001	0.000
20	0.021	0.001	0.000	0.015	0.001	0.000	20	0.022	0.027	0.000	0.000	0.001	0.000
25	0.030	0.003	0.000	0.007	0.001	0.000	25	0.028	0.014	0.000	0.000	0.002	0.000
30	0.041	0.004	0.000	0.004	0.002	0.000	30	0.055	0.001	0.000	0.000	0.001	0.000
35	0.077	0.011	0.000	0.002	0.010	0.000	35	0.082	0.001	0.000	0.000	0.009	0.000
40	0.106	0.000	0.000	0.004	0.015	0.000	40	0.115	0.000	0.000	0.000	0.005	0.000
45	0.079	0.000	0.000	0.003	0.028	0.000	45	0.046	0.000	0.000	0.001	0.004	0.000
50	0.023	0.000	0.000	0.034	0.047	0.000	50	0.013	0.000	0.000	0.006	0.005	0.000
55	0.000	0.000	0.000	0.101	0.032	0.000	55	0.000	0.000	0.000	0.007	0.007	0.000
60	0.000	0.000	0.000	0.095	0.000	0.000	60	0.000	0.000	0.000	0.024	0.006	0.000
65	0.000	0.000	0.000	0.123	0.000	0.000	65	0.000	0.000	0.000	0.254	0.000	0.000
70	0.000	0.000	0.000	0.022	0.000	0.000	70	0.000	0.000	0.000	0.220	0.000	0.000
75	0.000	0.000	0.000	0.000	0.000	0.000	75	0.000	0.000	0.000	0.000	0.000	0.000
2i. 45 MPH							2j. 50 MPH						
	Arterial	Collector	Local	Freeway	Ramp	Private		Arterial	Collector	Local	Freeway	Ramp	Private
5	0.001	0.000	0.000	0.000	0.001	0.000	5	0.002	0.000	0.000	0.000	0.000	0.000
10	0.002	0.000	0.000	0.000	0.001	0.000	10	0.003	0.001	0.000	0.000	0.000	0.000
15	0.003	0.000	0.002	0.000	0.002	0.000	15	0.007	0.001	0.000	0.000	0.000	0.000
20	0.005	0.000	0.005	0.000	0.004	0.000	20	0.009	0.002	0.000	0.000	0.000	0.000
25	0.011	0.000	0.003	0.000	0.007	0.000	25	0.019	0.004	0.000	0.000	0.001	0.000
30	0.012	0.000	0.005	0.003	0.013	0.000	30	0.034	0.013	0.000	0.000	0.001	0.000
35	0.013	0.000	0.000	0.004	0.015	0.000	35	0.037	0.002	0.000	0.000	0.001	0.000
40	0.048	0.000	0.000	0.012	0.018	0.000	40	0.036	0.000	0.000	0.000	0.002	0.000
45	0.062	0.000	0.000	0.012	0.019	0.000	45	0.010	0.000	0.000	0.000	0.003	0.000
50	0.071	0.000	0.000	0.043	0.021	0.000	50	0.002	0.000	0.000	0.007	0.005	0.000
55	0.000	0.000	0.000	0.047	0.021	0.000	55	0.000	0.000	0.000	0.054	0.005	0.000
60	0.000	0.000	0.000	0.221	0.032	0.000	60	0.000	0.000	0.000	0.165	0.004	0.000
65	0.000	0.000	0.000	0.159	0.002	0.000	65	0.000	0.000	0.000	0.268	0.016	0.000
70	0.000	0.000	0.000	0.098	0.000	0.000	70	0.000	0.000	0.000	0.229	0.006	0.000
75	0.000	0.000	0.000	0.000	0.000	0.000	75	0.000	0.000	0.000	0.048	0.004	0.000

* Trip speeds of greater than 50 MPH will use data from table 2j.

Table 3. Emission Allocation Factors by Facility / Speed

3a. 5 MPH

3b. 10 MPH

3c. 15 MPH

3d. 20 MPH

3e. 25 MPH

3f. 30 MPH

3g. 35 MPH

3h. 40 MPH

3i. 45 MPH

3j. 50 MPH and Trips Speeds Greater than 50 MPH

Table 4. Time Allocation Factors by Facility / Speed

4a. 5 MPH							4b. 10 MPH						
	Arterial	Collector	Local	Freeway	Ramp	Private		Arterial	Collector	Local	Freeway	Ramp	Private
0	0.000	0.000	0.318	0.000	0.000	0.000	0	0.000	0.000	0.318	0.000	0.000	0.000
5	0.000	0.000	0.441	0.000	0.000	0.000	5	0.000	0.000	0.441	0.000	0.000	0.000
10	0.000	0.000	0.117	0.000	0.000	0.000	10	0.000	0.000	0.117	0.000	0.000	0.000
15	0.000	0.000	0.064	0.000	0.000	0.000	15	0.000	0.000	0.064	0.000	0.000	0.000
20	0.000	0.000	0.029	0.000	0.000	0.000	20	0.000	0.000	0.029	0.000	0.000	0.000
25	0.000	0.000	0.031	0.000	0.000	0.000	25	0.000	0.000	0.031	0.000	0.000	0.000
30	0.000	0.000	0.000	0.000	0.000	0.000	30	0.000	0.000	0.000	0.000	0.000	0.000
35	0.000	0.000	0.000	0.000	0.000	0.000	35	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.000	0.000	0.000	0.000	0.000	40	0.000	0.000	0.000	0.000	0.000	0.000
45	0.000	0.000	0.000	0.000	0.000	0.000	45	0.000	0.000	0.000	0.000	0.000	0.000
50	0.000	0.000	0.000	0.000	0.000	0.000	50	0.000	0.000	0.000	0.000	0.000	0.000
55	0.000	0.000	0.000	0.000	0.000	0.000	55	0.000	0.000	0.000	0.000	0.000	0.000
60	0.000	0.000	0.000	0.000	0.000	0.000	60	0.000	0.000	0.000	0.000	0.000	0.000
65	0.000	0.000	0.000	0.000	0.000	0.000	65	0.000	0.000	0.000	0.000	0.000	0.000
70	0.000	0.000	0.000	0.000	0.000	0.000	70	0.000	0.000	0.000	0.000	0.000	0.000
75	0.000	0.000	0.000	0.000	0.000	0.000	75	0.000	0.000	0.000	0.000	0.000	0.000
4c. 15 MPH							4d. 20 MPH						
	Arterial	Collector	Local	Freeway	Ramp	Private		Arterial	Collector	Local	Freeway	Ramp	Private
0	0.126	0.154	0.000	0.000	0.014	0.002	0	0.116	0.016	0.033	0.008	0.000	0.004
5	0.033	0.062	0.019	0.000	0.007	0.000	5	0.081	0.039	0.017	0.010	0.000	0.000
10	0.017	0.052	0.014	0.000	0.002	0.000	10	0.028	0.023	0.010	0.007	0.000	0.000
15	0.017	0.043	0.019	0.000	0.000	0.000	15	0.060	0.024	0.011	0.004	0.000	0.000
20	0.038	0.059	0.021	0.000	0.000	0.000	20	0.060	0.026	0.007	0.000	0.000	0.000
25	0.047	0.064	0.064	0.000	0.000	0.000	25	0.055	0.059	0.013	0.000	0.000	0.000
30	0.026	0.028	0.014	0.000	0.000	0.000	30	0.063	0.039	0.018	0.000	0.000	0.000
35	0.000	0.057	0.000	0.000	0.000	0.000	35	0.059	0.011	0.000	0.000	0.000	0.000
40	0.000	0.000	0.000	0.000	0.000	0.000	40	0.074	0.000	0.000	0.000	0.000	0.000
45	0.000	0.000	0.000	0.000	0.000	0.000	45	0.026	0.000	0.000	0.000	0.000	0.000
50	0.000	0.000	0.000	0.000	0.000	0.000	50	0.000	0.000	0.000	0.000	0.000	0.000
55	0.000	0.000	0.000	0.000	0.000	0.000	55	0.000	0.000	0.000	0.000	0.000	0.000
60	0.000	0.000	0.000	0.000	0.000	0.000	60	0.000	0.000	0.000	0.000	0.000	0.000
65	0.000	0.000	0.000	0.000	0.000	0.000	65	0.000	0.000	0.000	0.000	0.000	0.000
70	0.000	0.000	0.000	0.000	0.000	0.000	70	0.000	0.000	0.000	0.000	0.000	0.000
75	0.000	0.000	0.000	0.000	0.000	0.000	75	0.000	0.000	0.000	0.000	0.000	0.000
4e. 25 MPH							4f. 30 MPH						
	Arterial	Collector	Local	Freeway	Ramp	Private		Arterial	Collector	Local	Freeway	Ramp	Private
0	0.091	0.002	0.037	0.000	0.009	0.004	0	0.092	0.001	0.000	0.000	0.005	0.000
5	0.061	0.002	0.037	0.000	0.002	0.000	5	0.058	0.000	0.000	0.009	0.006	0.000
10	0.019	0.004	0.019	0.000	0.001	0.000	10	0.026	0.000	0.000	0.041	0.011	0.000
15	0.039	0.011	0.027	0.000	0.000	0.000	15	0.035	0.000	0.000	0.052	0.003	0.000
20	0.029	0.008	0.037	0.000	0.000	0.000	20	0.042	0.000	0.000	0.065	0.003	0.000
25	0.041	0.012	0.032	0.000	0.000	0.000	25	0.046	0.000	0.000	0.018	0.004	0.000
30	0.062	0.020	0.041	0.000	0.000	0.000	30	0.080	0.000	0.000	0.038	0.002	0.000
35	0.124	0.011	0.021	0.000	0.000	0.000	35	0.044	0.000	0.000	0.011	0.003	0.000
40	0.129	0.000	0.000	0.000	0.000	0.000	40	0.015	0.000	0.000	0.020	0.004	0.000
45	0.036	0.000	0.000	0.000	0.000	0.000	45	0.002	0.000	0.000	0.055	0.006	0.000
50	0.032	0.000	0.000	0.000	0.000	0.000	50	0.000	0.000	0.000	0.091	0.022	0.000
55	0.000	0.000	0.000	0.000	0.000	0.000	55	0.000	0.000	0.000	0.064	0.015	0.000
60	0.000	0.000	0.000	0.000	0.000	0.000	60	0.000	0.000	0.000	0.009	0.000	0.000
65	0.000	0.000	0.000	0.000	0.000	0.000	65	0.000	0.000	0.000	0.000	0.000	0.000
70	0.000	0.000	0.000	0.000	0.000	0.000	70	0.000	0.000	0.000	0.000	0.000	0.000
75	0.000	0.000	0.000	0.000	0.000	0.000	75	0.000	0.000	0.000	0.000	0.000	0.000

Table 4 continued

4g. 35 MPH						4h. 40 MPH							
	Arterial	Collector	Local	Freeway	Ramp		Arterial	Collector	Local	Freeway	Ramp	Private	
0	0.050	0.030	0.005	0.000	0.003	0.000	0	0.054	0.008	0.000	0.000	0.001	
5	0.058	0.004	0.000	0.019	0.006	0.000	5	0.056	0.007	0.000	0.000	0.004	
10	0.023	0.002	0.000	0.017	0.010	0.000	10	0.052	0.001	0.000	0.000	0.004	
15	0.027	0.001	0.000	0.041	0.001	0.000	15	0.033	0.009	0.000	0.000	0.001	
20	0.033	0.002	0.000	0.024	0.001	0.000	20	0.038	0.046	0.000	0.000	0.001	
25	0.038	0.004	0.000	0.009	0.001	0.000	25	0.040	0.021	0.000	0.000	0.002	
30	0.044	0.004	0.000	0.004	0.002	0.000	30	0.064	0.001	0.000	0.000	0.001	
35	0.070	0.010	0.000	0.002	0.009	0.000	35	0.083	0.001	0.000	0.000	0.010	
40	0.085	0.000	0.000	0.003	0.012	0.000	40	0.103	0.000	0.000	0.000	0.004	
45	0.057	0.000	0.000	0.002	0.020	0.000	45	0.037	0.000	0.000	0.001	0.003	
50	0.015	0.000	0.000	0.021	0.030	0.000	50	0.010	0.000	0.000	0.004	0.000	
55	0.000	0.000	0.000	0.058	0.019	0.000	55	0.000	0.000	0.000	0.004	0.000	
60	0.000	0.000	0.000	0.050	0.000	0.000	60	0.000	0.000	0.000	0.014	0.004	
65	0.000	0.000	0.000	0.061	0.000	0.000	65	0.000	0.000	0.000	0.138	0.000	
70	0.000	0.000	0.000	0.010	0.000	0.000	70	0.000	0.000	0.000	0.114	0.000	
75	0.000	0.000	0.000	0.000	0.000	0.000	75	0.000	0.000	0.000	0.000	0.000	
4i. 45 MPH						4j. 50 MPH							
	Arterial	Collector	Local	Freeway	Ramp	Private		Arterial	Collector	Local	Freeway	Ramp	Private
0	0.032	0.009	0.001	0.000	0.000	0.000	0	0.030	0.003	0.000	0.000	0.000	0.000
5	0.015	0.004	0.006	0.000	0.021	0.000	5	0.041	0.005	0.000	0.000	0.000	0.000
10	0.008	0.001	0.002	0.000	0.005	0.000	10	0.015	0.003	0.000	0.000	0.000	0.000
15	0.010	0.000	0.005	0.000	0.005	0.000	15	0.021	0.004	0.000	0.000	0.000	0.000
20	0.012	0.000	0.010	0.000	0.009	0.000	20	0.022	0.005	0.000	0.000	0.000	0.000
25	0.020	0.000	0.005	0.000	0.013	0.000	25	0.039	0.008	0.000	0.000	0.001	0.000
30	0.018	0.000	0.008	0.004	0.019	0.000	30	0.054	0.021	0.000	0.000	0.002	0.000
35	0.017	0.000	0.000	0.005	0.019	0.000	35	0.051	0.003	0.000	0.000	0.001	0.000
40	0.052	0.000	0.000	0.014	0.020	0.000	40	0.045	0.000	0.000	0.000	0.002	0.000
45	0.062	0.000	0.000	0.012	0.018	0.000	45	0.010	0.000	0.000	0.000	0.003	0.000
50	0.063	0.000	0.000	0.038	0.019	0.000	50	0.002	0.000	0.000	0.006	0.004	0.000
55	0.000	0.000	0.000	0.038	0.017	0.000	55	0.000	0.000	0.000	0.047	0.004	0.000
60	0.000	0.000	0.000	0.164	0.025	0.000	60	0.000	0.000	0.000	0.133	0.003	0.000
65	0.000	0.000	0.000	0.110	0.002	0.000	65	0.000	0.000	0.000	0.199	0.012	0.000
70	0.000	0.000	0.000	0.064	0.000	0.000	70	0.000	0.000	0.000	0.159	0.004	0.000
75	0.000	0.000	0.000	0.000	0.000	0.000	75	0.000	0.000	0.000	0.032	0.002	0.000

* Trip speeds of greater than 50 MPH will use data from table 4j.